formed. The sheet was then annealed for 2.5 hours at 1130°C in a hydrogen atmosphere. At this anneal time, it is anticipated to obtain the steel of minimal carbon content, and produce the following soft magnetic properties: maximum permeability of 46,000μm, a core loss at different magnetic field/frequency (Gs/Hz) ranges, of $W_{10/50}$=0.49w/kg, $W_{10/400}$=10.56w/kg, $W_{5/1K}$=11.5w/kg, $W_{1/5K}$=8.71w/kg, $W_{10/400}$=6.5w/kg. Since the inventive process does not require the use of either costly starting materials or a CVD siliconizing step, large-scale economic production of high-silicon steel sheets of varying thickness made possible.

Example 5

A carbon containing high-silicon steel containing the following composition: 10 wt.% Si, 0.4965 wt.% carbon, less than 0.01% impurities consisting of one or more of Mn, P, S, Cr and Ni, balance iron. The sample was hot-rolled at 1000°C and the silicon steel exhibiting the following mechanical properties: The tensile ductility is over 15% at 200°C and increases to over 60% at 500°C. The yield strength is 800MPa at 200 to 400°C and 650MPa at 500°C.

What's claimed is:

1.A high silicon steel comprises 5-10 wt.% silicon, 0.007-1 wt.% carbon; less than 0.01 wt.% impurities consisting of one or more of Mn, P, S, Cr and Ni; and balance Fe.

2. A method of making a silicon steel, said method comprising adding about 0.01 to about 1.0 wt.% carbon to a steel containing from about 5 to 10 wt.% Si and subsequently homogenizing said steel at a temperature from about 1200°C to up to less than the melting point of said steel for a time sufficient to substantially remove most of the secondary phases from said steel, said homogenization process is carried out in a protective environment.

3. A method according to claim 2, wherein said homogenizing process is carried out in a protective environment, defined as a non-oxidizing environment, a de-carburizing environment or a vacuum.

4. A method according to claim 2, wherein said method using a thermo-mechanical control process to tailor the carbon content.

5. A method according to claim 2, wherein conventional metal working methods can be used to produce carbon-containing high-silicon steel sheets of various thickness, the thickness of the sheet is of 0.5mm, 0.35mm and 0.1mm respectively, a controlled microstructures for such sheets would have substantially uniform grains approximating to the thickness of the sheet, e.g., on the order of 0.5mm, 0.35mm and 0.1mm, respectively.

6. A method according to claim 5, wherein said conventional metal working methods comprise at least one of the following steps: (1) continuous casting and continuous hot rolling with rolling temperature between 600°C and 1000°C, ingot casting is continuously hot-rolled at temperature between 600°C and 1000°C; (2) combination of hot-rolling and cold-rolling with temperature between room temperature up to 500°C to produce thin sheets; (3) combination of hot-rolling of a single sheet and hot-rolling of double or multiple sheets to produce thin sheets.

7. A method according to claim 2, wherein the silicon steel produced by the method having a room temperature ductility of at least 10%; an elongation of greater than 20% from 200°C

to 800°C, and greater than 100% at or above 800°C; a strength of about 600MPa from room temperature to about 500°C; an oxidation rate of 0.01g/m^2 at 500°C after 50 hours of air exposure; and exhibiting the following soft magnetic properties: maximum permeability of 46,000µm, a core loss at different frequency ranges, of $W_{10/50}$=0.49w/kg, $W_{10/400}$=10.56w/kg, $W_{5/1K}$=11w/kg, $W_{1/5K}$=8.71w/kg, $W_{0.5/10}$=6.5w/kg.